

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Appellants: GROSS, et al. Patent Application
Application No.: 10/684,030 Group Art Unit: 2628
Filed: October 9, 2003 Examiner: Pappas, Peter
For: METHOD AND SYSTEM FOR CULLING VIEW DEPENDENT VISUAL DATA
STREAMS FOR A VIRTUAL ENVIRONMENT

APPEAL BRIEF

Table of Contents

| | <u>Page</u> |
|---|-------------|
| Real Party in Interest | 1 |
| Related Appeals and Interferences | 2 |
| Status of Claims | 3 |
| Status of Amendments | 4 |
| Summary of Claimed Subject Matter | 5 |
| Grounds of Rejection to Be Reviewed on Appeal | 8 |
| Argument | 9 |
| Conclusion | 14 |
| Appendix – Clean Copy of Claims on Appeal | 15 |
| Appendix – Evidence Appendix | 23 |
| Appendix – Related Proceedings Appendix | 24 |

I. Real Party in Interest

The assignee of the present application is Hewlett-Packard Development Company,

L.P.

200315391-1
Serial No.: 10/684,030

Group Art Unit: 2628

II. Related Appeals and Interferences

There are no related appeals or interferences known to the Appellants.

III. Status of Claims

Claims 1-33 are pending. Claims 1-33 are rejected. This Appeal involves Claims 1-33.

200315391-1
Serial No.: 10/684,030

Group Art Unit: 2628

IV. Status of Amendments

All proposed amendments have been entered. An amendment subsequent to the Final Action has not been filed.

200315391-1
Serial No.: 10/684,030

Group Art Unit: 2628

V. Summary of Claimed Subject Matter

Independent Claims 1, 13, 21, and 33 of the present application pertain to various embodiments of culling view dependent visual data streams for a virtual environment.

Independent Claim 1 recites, “A method for culling view dependent visual data streams for a virtual environment 300, 500.” This embodiment is described at least at page 7 line 5 to page 7 line 27; page 9 line 24 to page 10 line 20; Figure 1B; and Figure 2. “Determining 210 a view volume 321 of a viewing participant 320, 520 within said virtual environment 300, 500, wherein said view volume 321 defines a field-of-view of said viewing participant 320, 520 within said virtual environment 300, 500” is described at least at step 210, Figure 2; page 10 lines 4-9; page 11 line 16 to page 12 line 23; page 16 line 14 to page 17 line 27; Figure 3; and Figure 5. “Determining 220 a proximity of a representation of an observed object 310, 510 in said virtual environment 300, 500 to said view volume 321” is described at least at step 220, Figure 2; page 10 lines 11-14; page 11 line 16 to page 12 line 23; page 16 line 14 to page 17 line 27; Figure 3; and Figure 5. “Processing 230 a view dependent visual data stream of said observed object 310, 510 only when said representation is within a specified proximity 530 to said view volume 321” is described at least at step 230, Figure 2; page 10 lines 11-14; page 11 line 16 to page 12 line 23; page 16 line 14 to page 17 line 27; page 14 line 14 to page 16 line 12; Figure 3; and Figure 5.

Independent Claim 13 recites, “A system for culling view dependent visual data for a virtual environment 300, 500.” This embodiment is described at least at page 18; Figure 6; page 7 line 5 to page 7 line 27; page 9 line 24 to page 10 line 20; Figure 1B; and Figure 2. “A view volume generator 610 for determining 210 a view volume 321 of a viewing participant 320, 520 within said virtual environment 300, 500, wherein said view volume 321

defines a field-of-view of said viewing participant 320, 520 within said virtual environment 300, 500” is described at least at page 18; page 10 lines 4-9; step 210, Figure 2; page 11 line 16 to page 12 line 23; page 16 line 14 to page 17 line 27; Figure 3; and Figure 5. “A comparator 620 for determining 220 a proximity of a representation of an observed object 310, 510 in said virtual environment 300, 500 to said view volume 321” is described at least at page 18; step 220, Figure 2; page 10 lines 11-14; page 11 line 16 to page 12 line 23; page 16 line 14 to page 17 line 27; Figure 3; and Figure 5. “A processor 630 for processing 230 a view dependent visual data stream of said observed object 310, 510 only when said representation is within a specified proximity 530 to said view volume 321” is described at least at page 18; step 230, Figure 2; page 10 lines 11-14; page 11 line 16 to page 12 line 23; page 16 line 14 to page 17 line 27; page 14 line 14 to page 16 line 12; Figure 3; and Figure 5.

Independent Claim 21 recites, “A computer system.” This embodiment is described at least at page 5 lines 17-25; page 7 line 5 to page 7 line 27; page 9 line 24 to page 10 line 20; Figure 1B; and Figure 2. “A processor,” is described at least at page 5 lines 17-25. “A computer readable memory coupled to said processor and containing program instructions that, when executed, implement a method for culling view dependent visual data streams for a virtual environment 300, 500,” is described at least at page 5 line 17 to page 6 line 4; page 7 line 5 to page 7 line 27; page 9 line 24 to page 10 line 20; Figure 1B; and Figure 2. “Determining 210 a view volume 321 of a viewing participant 320, 520 within said virtual environment 300, 500, wherein said view volume 321 defines a field-of-view of said viewing participant 320, 520 within said virtual environment 300, 500” is described at least at page 10 lines 4-9; step 210, Figure 2; page 11 line 16 to page 12 line 23; page 16 line 14 to page 17 line 27; Figure 3; and Figure 5. “Determining 220 a proximity of a representation of an observed object 310, 510 in said virtual environment 300, 500 to said view volume 321” is

described at least at step 220, Figure 2; page 10 lines 11-14; page 11 line 16 to page 12 line 23; page 16 line 14 to page 17 line 27; Figure 3; and Figure 5. “Processing 230 a view dependent visual data stream of said observed object 310, 510 only when said representation is within a specified proximity 530 to said view volume 321” is described at least at step 230, Figure 2; page 10 lines 11-14; page 11 line 16 to page 12 line 23; page 16 line 14 to page 17 line 27; page 14 line 14 to page 16 line 12; Figure 3; and Figure 5.

Independent Claim 33 recites, “A computer readable medium containing executable instructions which, when executed in a processing system, causes the system to perform the steps for a method of culling view dependent visual data streams for a virtual environment 300, 500.” This embodiment is described at least at page 5 line 17 to page 6 line 4; page 7 line 5 to page 7 line 27; page 9 line 24 to page 10 line 20; Figure 1B; and Figure 2. “Determining 210 a view volume 321 of a viewing participant 320, 520 within said virtual environment 300, 500, wherein said view volume 321 defines a field-of-view of said viewing participant 320, 520 within said virtual environment 300, 500” is described at least at page 10 lines 4-9; step 210, Figure 2; page 11 line 16 to page 12 line 23; page 16 line 14 to page 17 line 27; Figure 3; and Figure 5. “Determining 220 a proximity of a representation of an observed object 310, 510 in said virtual environment 300, 500 to said view volume 321” is described at least at step 220, Figure 2; page 10 lines 11-14; page 11 line 16 to page 12 line 23; page 16 line 14 to page 17 line 27; Figure 3; and Figure 5. “Processing 230 a view dependent visual data stream of said observed object 310, 510 only when said representation is within a specified proximity 530 to said view volume 321” is described at least at step 230, Figure 2; page 10 lines 11-14; page 11 line 16 to page 12 line 23; page 16 line 14 to page 17 line 27; page 14 line 14 to page 16 line 12; Figure 3; and Figure 5.

VI. Grounds of Rejection to Be Reviewed on Appeal

1. Claims 1-4, 7-15, 17-24 and 27-33 are rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 5,745,126 by Jain et al (referred to hereinafter as “Jain”).
2. Claims 5, 6, 16, 25 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jain in view of U.S. Patent No. 6,100,862 by Sullivan (referred to hereinafter as “Sullivan”).

VII. Argument

1. Whether Claims 1, 4, 5, 7-9, 11, 12, 14, 15, 18, and 19 are Anticipated Under 35 U.S.C. §102(e) by Jain.

Appellants have reviewed the cited art and respectfully submits that the embodiments as recited in Claims 1, 4, 5, 7-9, 11, 12, 14, 15, 18, and 19 are not anticipated by Jain in view of the following rationale.

MPEP §2131 provides:

“A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.”

Verdegaal Bros. v. Union Oil Co. of California, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). ... “The identical invention must be shown in as complete detail as is contained in the ... claim.” *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989). The elements must be arranged as required by the claim.

Claim 1 recites,

A method for culling view dependent visual data streams for a virtual environment, comprising:

determining a view volume of a viewing participant within said virtual environment, wherein said view volume defines a field-of-view of said viewing participant within said virtual environment;

determining a proximity of a representation of an observed object in said virtual environment to said view volume; and

processing a view dependent visual data stream of said observed object only when said representation is within a specified proximity to said view volume.

A. Cited Art does not show the “Identical Invention”

Appellants understand Jain to teach a method or system that enables each viewer of a broadcast event, such as a football game, to be their own “director” (col. 2 line 67) by selecting, for example, a particular object that appears in a scene or an event depicted in the scene that they are interested in (Col. 7 lines 36-42). In a specific example, a viewer may select that they are interested in a particular player or the football itself (Col. 7 lines 33-34).

In this case, the selected object (foot ball or particular player) may be classified, tagged and

tracked (Col. 7 lines 51-64) to enable the viewer to view the selected object/event. It is possible for one of Jain's viewers to select a perspective that is not available from any camera (Col. 19 lines 5-6). Therefore, Appellants understand Jain, in one embodiment, to teach a view volume that surrounds a selected object or event. Since Jain's view volume surrounds a selected object or event, Appellants do not understand Jain's selected object or event to be capable of moving in or out of Jain's view volume for Jain's selected object/event.

Appellants do not understand Jain's object bounding box to teach or suggest the embodiment recited by Claim 1 either. For example, Appellants understand Jain's object bounding box to be used as a bounding box for an object and therefore the object that the bounding box surrounds would not move in or out of its bounding box. Further, even when objects are within relative proximity of each other, they are still classified as separate objects. This is possible because of Jain's history and tracking mechanism (Col. 35 lines 35-51).

Appellants do not understand Jain's cameras to teach or suggest the embodiment recited by Claim 1 either. For example, Appellants do not understand Jain to teach or suggest, among other things, processing a view dependent visual data stream of an observed object (observed by Jain's camera) only when said representation is within a specified proximity of a view volume of Jain's camera.

Thus, Appellants do not understand Jain to teach or suggest "processing a view dependent visual data stream of said observed object only when said representation is within a specified proximity of said view volume" (emphasis added) where "said view volume defines a field-of-view of said viewing participant within said virtual environment"

(emphasis added) and said representation is “a representation of an observed object in said virtual environment” nor to teach or suggest ”determining a proximity of a representation of an observed object in said virtual environment to said view volume,” as recited by Claim 1.

The Response to Arguments section states, “it is noted that the respective claim language is silent as to any limitations directed toward how said participant is graphically represented in said virtual environment.” Appellants respectfully submit that Claim 1 recites, “wherein said view volume defines a field-of-view of said viewing participant...determining a proximity of a representation of an observed object in said virtual environment to said view volume...processing a view dependent visual data stream of said observed object only when said representation is within a specified proximity to said view volume” (emphasis added).

For at least the reasons provided herein, Appellants submit that independent Claim 1 is not anticipated by Jain as the Rejection fails to establish a *prima facie* case for anticipation of Claim 1. For similar reasons, Appellants submit that independent Claims 13, 21 and 33 are not anticipated by Jain as the Rejection fails to establish a *prima facie* case for anticipation of Claims 13, 21 and 33. As such, Appellants submit that independent Claims 1, 13, 21 and 33 are in condition for allowance. Claims 1-12 depend from Claim 1. Claims 14-20 depend on Claim 13. Claims 22-32 depend on Claim 21. Hence, it is respectfully submitted that these dependent Claims are patentable over Jain for the reasons discussed above, and are in condition for allowance by virtue of their dependence upon a respective allowable base claim.

2. Whether Claims 5, 6, 16, 25 and 26 are Unpatentable Under 35 U.S.C. §102(e) over Jain in view of Sullivan.

Appellants have reviewed the cited art and respectfully submit that the embodiments as recited in Claims 5, 6, 16, 25 and 26 are neither taught nor suggested by Jain or Sullivan, alone or in combination, in view of the following rationale.

“As reiterated by the Supreme Court in KSR, the framework for the objective analysis for determining obviousness under 35 U.S.C. 103 is stated in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966). Obviousness is a question of law based on underlying factual inquiries” including “[a]scertaining the differences between the claimed invention and the prior art” (MPEP 2141(II)). “In determining the differences between the prior art and the claims, the question under 35 U.S.C. 103 is not whether the differences themselves would have been obvious, but whether the claimed invention as a whole would have been obvious” (emphasis in original; MPEP 2141.02(I)). Appellant notes that “[t]he prior art reference (or references when combined) need not teach or suggest all the claim limitations, however, Office personnel must explain why the difference(s) between the prior art and the claimed invention would have been obvious to one of ordinary skill in the art” (emphasis added; MPEP 2141(III)).

Claim 1 recites,

A method for culling view dependent visual data streams for a virtual environment, comprising:

determining a view volume of a viewing participant within said virtual environment, wherein said view volume defines a field-of-view of said viewing participant within said virtual environment;

determining a proximity of a representation of an observed object in said virtual environment to said view volume; and

processing a view dependent visual data stream of said observed object only when said representation is within a specified proximity to said view volume.

As already discussed herein, Appellants respectfully submit that independent Claim 1 is patentable over Jain. Further, independent Claims 13 and 21 are patentable over Jain for similar reasons that Claim 1 is patentable over Jain. Appellants respectfully agree with the Office Action that Sullivan does not teach the embodiments recited by independent Claims 1, 13 and 21. Claims 5 and 6 depend on independent Claim 1. Claims 16 and 25 depend on independent Claim 13. Claim 26 depends on independent Claim 21. These dependent claims should be patentable for at least the reasons that their respective independent claims should be patentable.

Conclusion

Appellants believe that pending Claims 1-4, 7-15, 17-24 and 27-33 are patentable over Jain. Appellants believe that pending Claims 5, 6, 16, 25 and 26 are patentable over Jain in view of Sullivan. As such, Appellants submit that Claims 1-33 are patentable over the cited references.

Appellants respectfully request that the rejection of Claims 1-33 be reversed. The Appellants wish to encourage the Examiner or a member of the Board of Patent Appeals to telephone the Appellants' undersigned representative if it is felt that a telephone conference could expedite prosecution.

Respectfully submitted,
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Dated: 3/24/2008

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200315391-1
Serial No.: 10/684,030

Group Art Unit: 2628

VIII. Appendix - Clean Copy of Claims on Appeal

1. A method for culling view dependent visual data streams for a virtual environment, comprising:

determining a view volume of a viewing participant within said virtual environment, wherein said view volume defines a field-of-view of said viewing participant within said virtual environment;

determining a proximity of a representation of an observed object in said virtual environment to said view volume; and

processing a view dependent visual data stream of said observed object only when said representation is within a specified proximity to said view volume.

2. The method of Claim 1, further comprising:

computing a three-dimensional model of said observed object, said three-dimensional model based on a plurality of real-time video streams taken of said observed object from a plurality of sample viewpoints.

3. The method of Claim 2, further comprising:

generating a view dependent video image stream by applying a new view synthesis technique to said three-dimensional model of said observed object, wherein said video image stream is generated from a viewpoint of said viewing participant.

4. The method of Claim 1, further comprising:

sending said visual data stream to said viewing participant.

5. The method of Claim 1, wherein said determining a view volume further comprises:

determining a view direction of said viewing participant to define said view volume, wherein said view volume comprises a series of expanding cross-sections of a geometric object along said view direction from said viewing participant within said virtual environment.

6. The method of Claim 5, wherein said geometric object comprises a four-sided rectangular plane.

7. The method of Claim 1, wherein said determining a proximity of a representation of an observed object in said virtual environment to said view volume, further comprises:

determining that said representation is within said specified proximity;
determining when said representation is occluded in said view volume such that said observed is not visible to said viewing participant; and
not generating said video image stream when said representation is occluded.

8. The method of Claim 1, further comprising:

providing for hysteresis and anticipation in delivering said video image stream to said viewing participant by defining an extended bounding volume that surrounds said observed object within said three-dimensional virtual environment, wherein said representation comprises said extended bounding volume when determining said proximity.

9. The method of Claim 1, further comprising:

enabling a change in a location of said viewing participant within said three-dimensional virtual environment by determining a new view volume of said viewing participant within said virtual environment;

determining when said representation falls within said new view volume; and

generating a video image stream of said observed object from said three-dimensional model when said representation is within said specified proximity to said new view volume

10. The method of Claim 1, further comprising:

enabling a change in location of said observed object within said three-dimensional virtual environment and reflecting said change in location in said representation.

11. The method of Claim 1, wherein said observed object comprises a local participant.

12. The method of Claim 1, wherein said virtual environment comprises a three dimensional N-way virtual collaborative environment.

13. A system for culling view dependent visual data for a virtual environment, comprising:

a view volume generator for determining a view volume of a viewing participant within said virtual environment, wherein said view volume defines a field-of-view of said viewing participant within said virtual environment;

a comparator for determining a proximity of a representation of an observed object in said virtual environment to said view volume; and

a processor for processing a view dependent visual data stream of said observed object only when said representation is within a specified proximity to said view volume.

14. The system of Claim 13, wherein a source comprises:

a model generator computing a three-dimensional model of said observed object that is based on a plurality of real-time video streams taken of said observed object from a plurality of sample viewpoints; and

a new view synthesis module for generating a view dependent video image stream by applying a new view synthesis technique to said three-dimensional model of said observed object, wherein said video image stream is generated from a viewpoint of said viewing participant.

15. The system of Claim 13, further comprising:

a transmitter for sending said visual data stream to said viewing participant.

16. The system of Claim 13, wherein said view volume generator determines a view direction of said viewing participant to define said view volume, wherein said view volume comprises a series of expanding cross-sections of a geometric object along said view direction from said viewing participant within said virtual environment

17. The system of Claim 13, wherein said comparator determines when said representation is occluded in said view volume such that said viewing participant is unable to view said observed object, such that said video image stream is not generated when said representation is occluded.

18. The system of Claim 13, wherein said representation comprises an extended bounding volume that surrounds said observed object within said virtual environment, wherein said representation comprises said extended bounding volume when determining said proximity.

19. The system of Claim 13, wherein said view volume generator enables a change in a location of said viewing participant to a new location within said virtual environment by changing said view volume of said viewing participant within said virtual environment to reflect said new location.

20. The system of Claim 13, wherein said comparator enables a change in location of said observed object to a new location within said three-dimensional virtual environment and reflects said change in location in said representation.

21. A computer system comprising:

- a processor; and
- a computer readable memory coupled to said processor and containing program instructions that, when executed, implement a method for culling view dependent visual data streams for a virtual environment, comprising:
 - determining a view volume of a viewing participant within said virtual environment, wherein said view volume defines a field-of-view of said viewing participant within said virtual environment;
 - determining a proximity of a representation of an observed object in said virtual environment to said view volume; and

processing a view dependent visual data stream of said observed object only when said representation is within a specified proximity to said view volume.

22. The computer system of Claim 21, wherein said method further comprises:
computing a three-dimensional model of said observed object, said three-dimensional model based on a plurality of real-time video streams taken of said observed object from a plurality of sample viewpoints.

23. The computer system of Claim 22, wherein said method further comprises:
generating a view dependent video image stream by applying a new view synthesis technique to said three-dimensional model of said observed object, wherein said video image stream is generated from a viewpoint of said viewing participant.

24. The computer system of Claim 21, wherein said method further comprises:
sending said visual data stream to said viewing participant.

25. The computer system of Claim 21, wherein said determining a view volume in said method further comprises:
determining a view direction of said viewing participant to define said view volume, wherein said view volume comprises a series of expanding cross-sections of a geometric object along said view direction from said viewing participant within said virtual environment.

26. The computer system of Claim 25, wherein said geometric object comprises a four-sided rectangular plane.

27. The computer system of Claim 21, wherein said determining a proximity of a representation of an observed object in said virtual environment to said view volume in said method, further comprises:

determining that said representation is within said specified proximity;

determining when said representation is occluded in said view volume such that said observed is not visible to said viewing participant; and

not generating said video image stream when said representation is occluded.

28. The computer system of Claim 21, wherein said method further comprises:

providing for hysteresis and anticipation in delivering said video image stream to said viewing participant by defining an extended bounding volume that surrounds said observed object within said three-dimensional virtual environment, wherein said representation comprises said extended bounding volume when determining said proximity.

29. The computer system of Claim 21, wherein said method further comprises:

enabling a change in a location of said viewing participant within said three-dimensional virtual environment by determining a new view volume of said viewing participant within said virtual environment;

determining when said representation falls within said new view volume; and

generating a video image stream of said observed object from said three-dimensional model when said representation is within said specified proximity to said new view volume

30. The computer system of Claim 21, wherein said method further comprises:

enabling a change in location of said observed object within said three-dimensional virtual environment and reflecting said change in location in said representation.

31. The computer system of Claim 21, wherein said observed object comprises a local participant.

32. The computer system of Claim 21, wherein said virtual environment comprises a three dimensional N-way virtual collaborative environment.

33. A computer readable medium containing executable instructions which, when executed in a processing system, causes the system to perform the steps for a method of culling view dependent visual data streams for a virtual environment, comprising:

determining a view volume of a viewing participant within said virtual environment, wherein said view volume defines a field-of-view of said viewing participant within said virtual environment;

determining a proximity of a representation of an observed object in said virtual environment to said view volume; and

processing a view dependent visual data stream of said observed object only when said representation is within a specified proximity to said view volume.

IX. Evidence Appendix

No evidence is herein appended.

200315391-1
Serial No.: 10/684,030

Group Art Unit: 2628

X. Related Proceedings Appendix

No related proceedings.

200315391-1
Serial No.: 10/684,030

Group Art Unit: 2628